REMARKS/ARGUMENTS

Applicant acknowledges and appreciates the Examiner's comments during a telephone interview with the undersigned on January 8, 2009 wherein the claim amendments presented above and the cited references were discussed.

Status of Claims

Claims 1-4, 12-13, 15 and 17-18 have been amended. Claim 6 and 11 remain unchanged. Claims 20, 23, 26-27, 31-34 and 40 are withdrawn. Claims 5, 7-10, 14, 16, 19, 21-22, 24-25, 28-30, 35-39 and 41-43 have been canceled.

Summary of Office Action

In the Office Action, claims 1-4, 6, 11-13 and 15-18 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite due to the use of the term "said jaw" in claim 1. Claims 1-3, 6, 13, 15 and 17-18 stand rejected as allegedly rendered obvious from the combination of previously-cited U.S. Patent No. 5,725,376 (Poirier) in view of newly cited U.S. Patent Nos. 6,859,565 (Baron) and 5,800,168 (Cascione et al.). Claims 4 and 12 stand rejected as allegedly rendered obvious from the combination of Poirier, Baron, Cascione and U.S. Patent No. 5,927,982 (Kruger). Claim 11 stands rejected as allegedly rendered obvious from the combination of Poirier, Baron and Cascione and U.S. Patent No. 6,488,503 (Lichkus et al.).

For the following reasons, applicants respectfully traverse these rejections.

Rejection Under 35 U.S.C. 112, Second Paragraph

In the Office Action, the Examiner has objected to the term "said jaw" in claim 1 as lacking antecedent basis. The Examiner has suggested changing the term "jaw" to "patient jaw". In

response, the claims have been amended to clarify that the term "jaw" refers to the "patient's jaw". Accordingly, it is believed that this rejection has been overcome.

Description of the Invention

The following description of the invention is taken from the specification and is provided for the Examiner's convenience. It is not intended to argue limitations not present in the claims, or to argue for an interpretation of any claim term that is more narrow than would otherwise be understood by one of ordinary skill in the art based upon a full and fair reading of the application as a whole.

The invention is directed to a method for producing an artifact-corrected image of a negative jaw impression, so that an accurate drilling template may be made of the patient's jaw. The artifacts are the result of existing metal in the patient's teeth and/or jaw. The method comprises forming a negative impression of the patient's jaw. Most sets of teeth of a patient include non-naturally occurring metal inserts in one or more of the teeth, such as fillings. If a CT scan is taken of a patient's jaw with metal fillings in it, the metal fillings obscure any portion of the jaw that is located behind the filling. Additionally, the fillings scatter the x-rays or CT rays that impinge thereon so that the image of the jaw in the vicinity of the fillings is not complete and is likely to be distorted. These distortions are referred to as "artifacts" in the instant application (*see*, para. [0009]: "When the recipient mouth contains metal inserts such as tooth fillings, the image produced using CT contains many artifacts that smear and/or distort the true surface boundaries of the recipient jaw.").

The specification continues:

> [0015] In an exemplary embodiment of the present invention, a negative impression is made of a recipient jaw and two digital images are made using, for example, CT, MRI or another imaging system. A first distorted image is made that includes the negative mouth impression installed in the recipient jaw

including the metal inserts, for example *metal fillings, and their resultant artifacts*. A second image is made only of the negative impression. As the negative impression template does not include *metal inserts*, the resultant image correctly reproduces an image that is free of *artifacts*." (emphasis added)

In a prior response, applicants pointed out the meaning of the term "artifact" as used in the specification, and argued that this meaning should be ascribed to the term in the claims. The Examiner disagreed, and argued that the claims must be given the broadest possible interpretation, and that limitations from the specification cannot be imported into the claims.

Applicants not only presented the argument as to the proper interpretation to be given the term "artifact" as used in the claims, but also pointed to specific citations in the specification which supported this interpretation. Nevertheless, to further clarify the meaning of the term "artifact", applicants have amended claim 1 to state that the artifact results from "the presence of existing metal in at least one of the patient's teeth or jaw".

The presence of these unavoidable artifacts resulting from metal in the patient's teeth or jaw renders an uncorrected image of the jaw inaccurate. The invention herein provides a method for correcting the image of the jaw resulting from the presence of such artifacts in the patient's teeth or jaw. This is accomplished by taking a digital image of the negative impression. This image is free of artifacts – because there are no metal artifacts in the negative impression – and provides a base reference for the later comparison. Preferably, the negative impression includes reference markings (claim 4). The inventive method further comprises taking a digital image of the negative impression while the negative impression is in the patient's mouth. This image includes the artifacts to be corrected as a result, for example, of fillings in the patient's teeth. According to the inventive method, the first and second images are compared, and from that comparison, an artifact-corrected image is produced. This image is the desired end result of the process, since it enables the

formation of an accurate drilling template with full and accurate knowledge of the actual surfaces of the teeth.

Unless the artifacts are removed (*i.e.*, corrected), the drilling template may be less than perfectly accurate, which leads to problems if it is then used to drill into the patient's jaw or teeth in the wrong location or at the wrong angle, or if the template is not securely mounted on the teeth (*see*, paras. [0015]-[0016]). The inventive method, therefore, overcomes the deficiencies of the prior art where artifacts were present.

Discussion of Cited Prior Art References

In the Office Action, the Examiner has rejected claims 1-3, 6, 13, 15 and 17-18 as allegedly rendered obvious from the combination of Poirier in view of Baron and Cascione et al. According to the Office Action, Poirier discloses the forming of a negative impression of the patient jaw (gum surfaces and teeth). The Office Action cites the Abstract, lines 5-9. The Office Action further admits that Poirier does not teach explicitly the producing of a first digital image of the negative jaw impression, and producing a second digital image of the negative jaw impression and of the patient jaw, including the artifacts, and comparing the first digital image and the second digital image to produce an artifact-corrected computer representation of the negative impression of the patient jaw. The Office Action attempts to solve these deficiencies by relying on Baron and Cascione et al.

Initially, it is again pointed out that the Poirier patent is known by the applicants and is discussed in the subject specification at paragraph [0004]. Applicants agree that Poirier describes a method of forming a drilling template. However, the drilling template is a *positive* model of the structural details of a patient's jawbone, gum surface shape and *proposed* teeth or dental prosthesis shape information. Contrary to the Office Action, Poirier does not describe forming a negative

impression of the patient jaw but, rather, a *positive* model. More importantly, the positive model does not include information about the patient's teeth; rather the information is of "proposed teeth". See, Abstract, line 4. This is further supported by Poirier col. 3, lines 2-5 which states:

> "The patient is typically edentured, namely, the patient has had all teeth pulled from the jawbone, and the jawbone has been given time to heal since the teeth were pulled".

Thus, Poirier is not concerned, in anyway whatsoever, with the presence of artifacts caused by metal in the patient's teeth or jawbone because the patient has no teeth when the computer model of the jawbone is created.

The reliance on Baron does not satisfy any deficiency of Poirier. In particular, Baron is not even related to the dental arts but, rather, to general photography and, more specifically, to a method to remove unwanted effects produced by a flash, i.e. a "flash artifact", from a digital image. Specifically, a difference image is obtained by subtracting two digital images, one taken with a flash and one without a flash, and the portions of the different image having an intensity greater than an intensity threshold are stored in an artifact image. Applicants disagree that it would have been obvious to one having ordinary skill in the art at the time of the invention to combine Poirier with Baron. As explained above, Poirier does not address the problem of artifacts in an image of a negative jaw impression wherein the artifacts result from "the presence of metal in at least one of the patient's teeth or jaw" as now recited in claim 1. Rather, Poirier involves creating a computer model of a patient's jaw which has had all teeth pulled from the jawbone. Thus, there would be no artifacts resulting from, for example, fillings in a patient's teeth. Flash photography is not used in the computer model of Poirier. Nor is it used in applicants' invention -- which uses x-rays, CT rays or MRI, for example, for obtaining an image. In contrast, Baron is directed to the field of general photography and, more specifically, to photography which uses a "flash" which, as a result,

produces unwanted results. Accordingly, there is no reason that one of ordinary skill in the art at the time of the invention would consider combining Poirier with Baron in the manner suggested in the Office Action.

Cascione, et al. describe an adjustable guiding device for positioning dental implants. The device is constructed with a pivotable radio-opaque guide tube 1, positioned within a template 8, made from a model of the patient's dental arch (col. 6, lines 66-67). Template 8 also includes two radio-opaque reference tubes 9 (Fig. 2) so as to be visible in a radiograph of the patient's mouth (col. 7, lines 5-12). These guide tubes are used to help position the patient (col. 7, lines 17-20) before taking a radiograph. They do not teach using "before and after" radiographs matched by radio-opaque markers to eliminate artifacts. In fact, they teach away from doing so, since they teach that the patient should be made to position himself in a set position, as determined by the reference guides, so that correction is unnecessary (*Id.*). Since each radiograph is taken with the patient forcibly positioned in the same way for each radiograph, there would be no need to align before-and-after images as they are already self-aligned.

Cascione, et al. also fail to teach or suggest correcting for artifacts that arise from metal found in the patient's teeth or jaw. The "artifacts" referred to by Cascione, et al. in the passage referenced in the Office Action (col. 9, lines 21-26) are artifacts that result from the device itself when inserted into the patient's mouth. The reference provides no guidance in correcting for artifacts which result from pre-existing metal objects, such as prior implants and/or fillings. It would, therefore, not be obvious for one of ordinary skill in the art to combine the Cascione, et al. reference with Poirier and/or Barron, since none of them deal with the very heart of the invention: correcting radiographs to overcome the problems associated with the existence of

metal in the patient's teeth or jaw. It would also not be obvious to one of ordinary skill in the art to even address the problem addressed by the instant invention, or to realize the benefits afforded by the invention, since Cascione, et al. avoid the problem in a different way: having successive radiographs taken with the patient in the same position as guaranteed by reference tubes 9.

For all these reasons, therefore, it is respectfully submitted that one of ordinary skill in the art would not find the invention as claimed to be obvious in view of the references applied by the Examiner, either taken alone or in any combination.

The remaining, non-withdrawn, claims depend either directly or indirectly from claim 1 and are, therefore, believed to be patentable over the cited references for at least the same reasons as set forth above.

Conclusion

For all of the foregoing reasons, it is believed that all pending, non-withdrawn, claims are in condition for immediate allowance.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,
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Dated: December 29, 2008